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(71) Applicant(s)  
**Nokia Mobile Phones Limited**  
(Incorporated in Finland)  
Keilalahdentie 4, 02150 Espoo, Finland

(72) Inventor(s)  
**Takashi Sato**  
**Mika Oyyry**  
**Juha Uusi-Hallila**  
**Marja Pulkka**

(74) Agent and/or Address for Service  
**Nokia IPR Department**  
**Nokia House, Summit Avenue, Southwood,**  
**FARNBOROUGH, Hampshire, GU14 0NG,**  
**United Kingdom**

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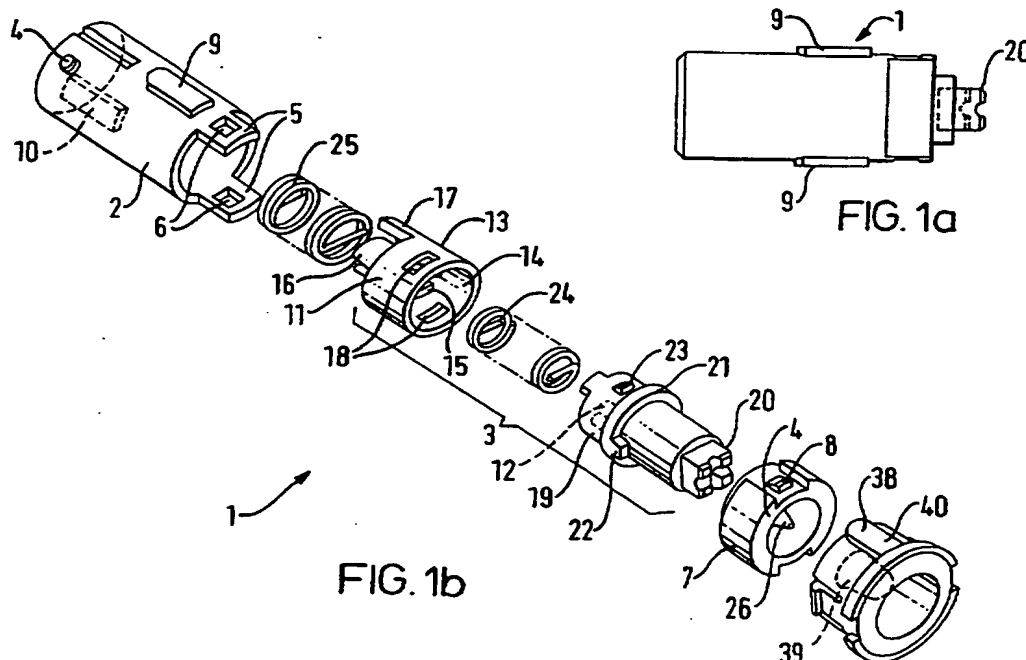
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**EP 0588210 A1** **US 5568358 A**

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(54) Abstract Title  
**Hinge for a mobile phone**

(57) As shown, a hinge for a mobile telephone has a push-button (38) which allows the lid (30, fig 2) to spring open. Push-button (38) is rotationally fixed in boss (33, fig 2) but allowed axial movement. The remaining hinge elements (11, 12, 24 and 25) are secured by the coupling element (7) within the cylindrical housing (2) which is mounted in the boss (35, fig 2). Pushing the button (38) releases lug (22) of the mounting boss (12) from the notch (26) in the coupling element (7). This allows rotation between mounting boss (12) and the rotating element (11) and also rotation between cylindrical housing (2) and push-button (38). Rotation is provided by springs (24, 25) which are rotationally biased.

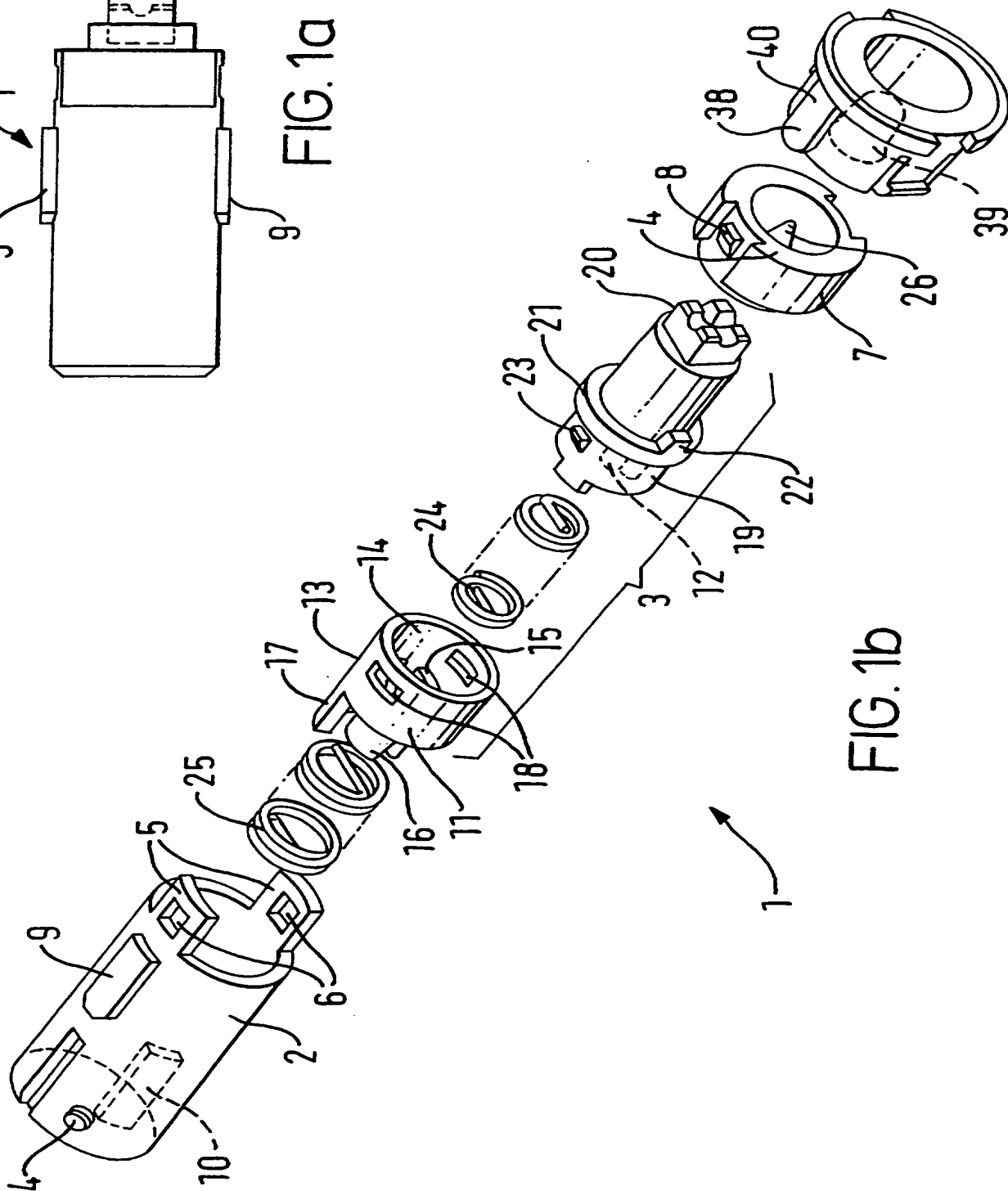
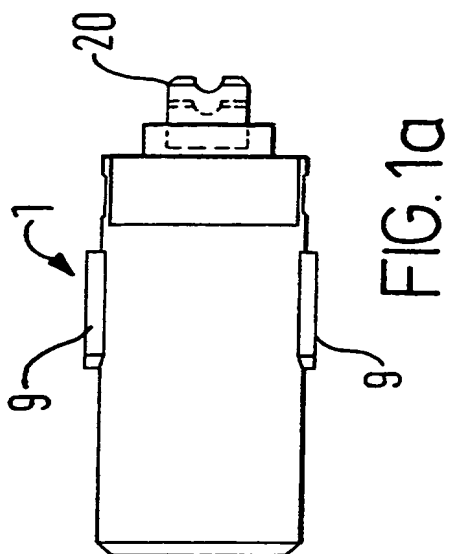


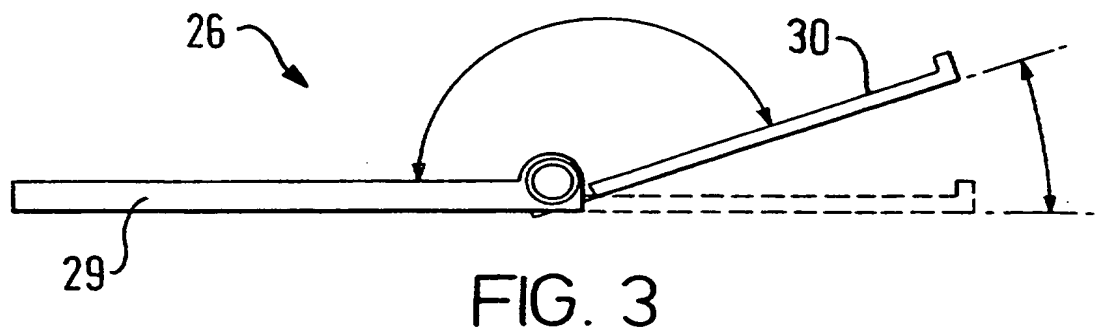
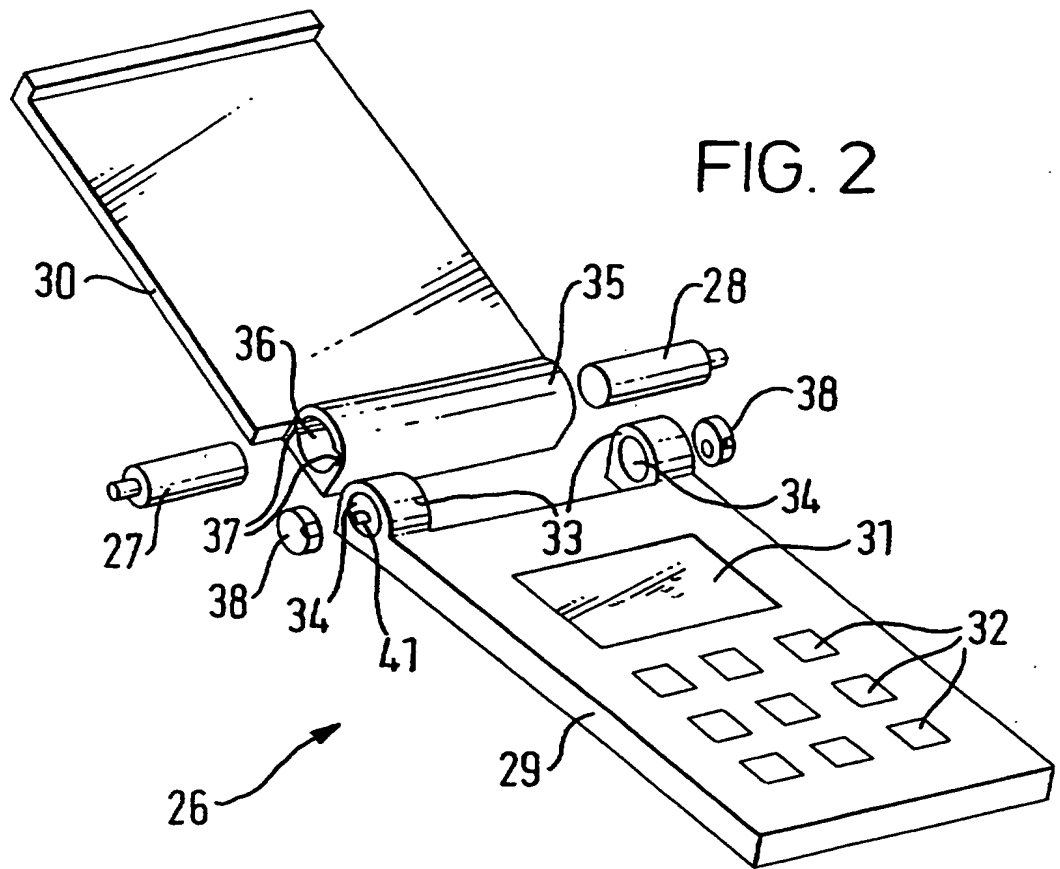
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The reference to figure(s) 1C & 4 of the drawings in the printed specification are to be treated as omitted under Section 15(2) or (3) of the Patents Act 1977.

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## HINGE

- 5 This invention relates to a hinge, in particular a hinge for rotating a cover element of a communication device between a first and second position.

A style of communication device that has become increasingly popular is the flip style radiotelephone, otherwise known as a flip radiotelephone.

10

A flip radiotelephone has a lid that is hinged to, typically, the top or bottom of the main radiotelephone housing with the lid being rotateable between an opened and closed position.

- 15 The display and keys of the radiotelephone are arranged on the lid and/or the main radiotelephone housing such that when the lid is in the opened position the display and keys are accessible to the user and in the closed position at least a portion of the display and at least some of the keys are covered and inaccessible to the user.

20

When the radiotelephone is not in use the lid is closed over the top of the main radiotelephone housing, thereby protecting the display and keys of the radiotelephone. When use of the radiotelephone is required the lid is opened, thereby exposing the display and keys of the radiotelephone.

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However, opening the flip radiotelephone lid is typically a two handed operation. One hand is needed to hold the main radiotelephone housing with a second hand required for opening and closing the lid. To a user requiring single-handed operation this is undesirable.

30

One solution to this problem has been to spring bias the lid open, using a latch mechanism to maintain the lid in a closed position. The latch mechanism is controlled via a single remote actuation device that is arranged, on user actuation, to release the latch and hence allowing the spring bias to open the lid. The remote actuation device is located some distance from the hinge, typically using a mechanical linkage to couple the actuation device to the latch mechanism. However, the use of a remote actuation device increases the mechanical complexity of a radiotelephone and hence the complexity of the manufacturing process. Further, it is possible for a single remote actuation device to be accidentally knocked, for example in a user's pocket or briefcase, resulting in the latch being released, thereby resulting in the lid accidentally opening and exposing the radiotelephones user keys and display to possible damage. Furthermore, in some flip radiotelephones when the flip is in the closed position some, or all, of the keys are deactivated and reactivated on moving the flip too the open position. It is undesirable to have the radiotelephone accidentally activated due to accidental actuation of the remote actuation device.

It would be desirable to improve this situation.

20

In accordance with a first aspect of the present invention there is provided a hinge for rotating a first element of a radiotelephone between a first and second position, the hinge comprising a first part for mounting to the first element; a second part for mounting to a second element of the radiotelephone; and means for providing rotational movement between the first part and the second part in response to a longitudinal movement of the first part relative to the second part.

The longitudinal movement of the first part is along the axis about which the first and second part rotate.

30

This has the advantage of allowing a flip radiotelephone lid to be opened single handed using a finger or thumb, of the hand holding the main radiotelephone housing, to depress a part of the hinge along the hinges longitudinal axis.

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Having a hinge which provides rotational movement in response to a longitudinal movement can minimise the complexity and manufacture of a radiotelephone. This is particular so if the hinge is already an assembled item when incorporated into a radiotelephone.

10

Preferably the first element is a radiotelephone lid.

Preferably the first part is an actuation button.

15 Preferably the means for providing rotational movement comprises a latch; and a spring arranged to extend the first part into the latch when a rotational bias is applied to the spring thereby defining a latched position, which defines the first position of the first element.

20 In accordance with a second aspect of the present invention there is provided a radiotelephone having a hinge for rotating a first element of the radiotelephone between a first and second position, the hinge comprising a first part for mounting to the first element; a second part for mounting to a second element of the radiotelephone; and means for providing rotational  
25 movement between the first part and the second part in response to a longitudinal movement of the first part relative to the second part.

In accordance with a third aspect of the present invention there is provided a radiotelephone having two hinges arranged to rotate a first element of a  
30 radiotelephone between a first and second position, each hinge comprising a

first part for mounting to the first element; a second part for mounting to a second element of the radiotelephone; and means for providing rotational movement between the first part and the second part in response to a longitudinal movement of the first part relative to the second part; wherein the  
5 first element of the radiotelephone is arranged to rotate in response to a longitudinal movement of the first part relative to the second part of both the first and second hinge.

By having two hinges that operate independently it is possible to open the flip  
10 radiotelephone lid single handed by depressing both of the hinges together along their respective longitudinal axis using a thumb and fore finger respectively. This also has the advantage of minimising the risk of the lid being opened accidentally, for example in a users pocket or briefcase.

15 For a better understanding of the present invention and to understand how the same may be brought into effect reference will now be made, by way of example only, to the accompanying drawings, in which:-

Figure 1a shows a hinge according to an embodiment of the invention;  
20

Figure 1b shows an exploded view of a hinge according to an embodiment of the invention from a first perspective view;

Figure 1c shows an exploded view of a hinge according to an embodiment of  
25 the invention from a second perspective view;

Figure 2 shows a hinge according to an embodiment of the invention incorporated in a radiotelephone;

Figure 3 shows an exploded view of a radiotelephone incorporating a hinge according to an embodiment of the invention in an opened position;

Figure 4 shows a radiotelephone incorporating a hinge according to an embodiment of the invention.

Figure 1b shows a hinge 1 having a cylindrical housing 2 and a rotating member 3.

- 10 The cylindrical housing 2 has a hollow cylindrical section that has an opening at one end and has a solid wall section at the other. On the solid wall section is formed a lug 4 projecting into the cylindrical section along the cylindrical section's axis. The lug 4 has a groove extending across the lug 4 to separate the lug into two halves, thereby allowing the lug to act as an anchor point.
- 15 Extending from the rim of the cylindrical housing opening are two resilient mounting lugs 5, each lug 5 having an aperture 6 to allow a snap fit to a separate annular coupling element 7 with complementary lugs 8.

- On the external surface of the cylindrical housing 2 are two mounting lugs 9
- 20 which extend substantially parallel to the axis of the cylinder and are located opposite each other. The mounting lugs 9 are for preventing rotation of the cylindrical housing 2 when mounted in a radiotelephone, as described in detail below.

- 25 Moulded on the inner surface of the cylindrical section of the cylindrical housing 2 projecting towards the cylindrical section's axis is a lug 10. The lug 10 is for restricting the range of rotation of the rotating member 3, as described in detail below.

- 30 The rotating member 3 has a rotating element 11 and a mounting boss 12.



The rotating element 11 has a cylindrical section 13 with a recess 14. In the recess 14 is formed a lug 15 projecting along the cylindrical sections axis. The lug 15 has a groove extending across the lug 15 to separate the lug into two halves, thereby allowing the lug to act as an anchor point. A grooved lug 16 is formed on the surface opposite to the grooved lug 15. The lug 16 has a groove extending across the lug 16 to separate the lug into two halves, thereby allowing the lug to act as an anchor point. Extending away from the cylindrical section 13 in the same direction as the projecting grooved lug 16 is a skirt section 17 that is formed around approximately half the circumference of the cylindrical section 13.

The cylindrical section 13 of the rotating element 11 has two slots 18 formed in the section 13. The slots 18 extend through into the recess and are positioned opposite to each other. Each slot 18 is formed around approximately 20° of the circumference of the cylindrical section 13.

The mounting boss 12 is a cylindrical element on which is formed at one end a projecting grooved lug 19. The lug 19 has a groove extending across the lug 19 to separate the lug into two halves, thereby allowing the lug to act as an anchor point. On the other end of the cylindrical element is formed a rectangular boss 20 for mounting to a radiotelephone, as described below.

Around the circumference of the mounting boss is formed a raised rim 21. On the rim 21 is formed a lug 22 extending along the axis of the mounting boss 12 towards the rectangular boss 20.

Also formed on the mounting boss 12 between the grooved lug 19 and the raised rim 21 are two further lugs 23. The lugs 23 are sized to fit into slots 18 on the rotating element 11.

Mounted into the recess 14 of the cylindrical section 13 is a helical spring 24. Both ends of the spring 24 are bent across the respective ends of the spring 24 to form a bar across each end of the helical spring 24.

5

One bar of the helical spring 24 is located in the groove of the projecting lug 15 formed in the recess 14 of the rotating element. The other bar of the helical spring 24 is located in the grooved projecting lug 19 formed on the mounting boss 12. This anchors each end of the spring 24 to the rotating element 11 and mounting boss 12 respectively.

10

The rotating element 11 and mounting boss 12 are snap fit together with lugs 23 engaging with slots 18. The lugs 23 are dimensioned to be narrower than slots 18 to allow rotation of the rotating element 11 relative to the mounting boss 12. Typically the lugs 23 and slots 18 will be dimensioned to allow rotation of the rotating element 11 relative to the mounting boss 12 by up to 20°. The rotational orientation of rotating element 11 relative to the mounting boss 12 is determined by the position of the grooved lugs 15, 19, which are coupled via spring 24.

15

20

Mounted in the cylindrical housing 2 is a helical spring 25. Both ends of the spring 25 are bent across the respective ends of the spring 25 to form bars across each end of the helical spring 25.

25

The rotating member 3 is inserted into the cylindrical housing 2 with one bar of spring 25 located in the projecting lug 4 mounted within the cylindrical housing 2. The other bar of the helical spring 25 is located in the projecting lug 16 formed on the rotating member 3. This anchors each end of the spring 25 to the cylindrical housing 2 and rotating member 3 respectively.

30

The skirt section 17 of the rotating element 11 and the lug 10 on the inner surface of the cylindrical housing 2 are sized to allow, when the rotating member 3 is inserted in to the cylindrical housing 2, relative rotation of the rotating member 3 by up to 160°. That is to say on the limits of rotation the edge of the lug 10 and skirt 17 but against each other.

The rotating member 3 is retained in the cylindrical housing 2 by means of the annular coupling element 7.

The annular coupling element 7 is snap fit to the cylindrical housing 2 with spring 25 providing a spring bias against the rotating member 3. As each end of the spring 25 is anchored the spring 25 provides a rotational bias between the cylindrical housing 2 and the rotating member 3. Correspondingly, spring 24 provides a rotational bias between the rotating element 11 and the mounting boss 12. However, the rotational spring bias of spring 25 is in the opposite direction to the rotational spring bias of spring 24.

The lug 22 formed on the raised rim 21 of the rotating member 3 butts against the inner rim of the annular coupling element 7 to retain the rotating member 3 in the cylindrical housing 2.

The annular coupling element 7 has a groove 26 formed on the inner surface. The groove 26 is sized to complement the size of the lug 22 such that when the lug 22 and groove 26 are aligned the bias of spring 25 operates to move the lug 22 into the groove 26, with the groove 26 acting as a latching mechanism.

When the annular coupling element 7 is snap fit to the cylindrical housing 2 the groove 26 and the lug 22 are positioned so that the rotational bias of spring 25 ensures that the groove 26 and lug 22 are mis-aligned. To align the

lug 22 and groove 26 the rotating member 3 must be rotated relative to the cylindrical housing 2 against the rotational bias of spring 25. When the lug 22 and groove 26 are aligned the compression bias of spring 25 forces the lug 22 into the groove 26 latching the rotating member 3 into a fixed position relative to the cylindrical housing 2. Therefore, when the lug 22 is engaged with groove 26 a rotational bias acts upon the spring 25.

When a force is applied against the compressive bias of spring 25 (i.e. a longitudinal force along the axis of the hinge) resulting in the lug 22 disengaging from the groove 26, the rotational bias of the spring 25 causes the rotating member 3 to rotate back to its original position.

As stated above, the skirt section 17 of the rotating member 3 and the lug 10 on the inner surface of the cylindrical housing 2 are sized to limit relative rotation of the rotating member 3 to 160°.

The rotation of the rotating element 11 relative to the mounting boss 12 provides an additional rotation of up to 20°. However, as the rotational spring bias of spring 24 is in the opposite direction to the rotational spring bias of spring 25 this allows the mounting boss 12 to rotate relative to the cylindrical housing 2 by 20° in a direction opposite to the latched position.

Figure 2 shows a flip radiotelephone 26 with two hinges 27, 28, each hinge 27, 28 being of similar construction to the hinge 1 described above. A single hinge could be used for opening a lid of a radiotelephone, however the use of two hinges which both need to be depressed together to open the lid of the radiotelephone minimises the risk of accidentally opening the lid.

The flip radiotelephone 26 has a main radiotelephone housing 29 coupled to a lid 30 via the two hinges 27, 28. The main radiotelephone housing 29 and lid

30 are hinged at the top of the main housing 29 to allow the lid 30 to rotate away from a user when being opened.

The main radiotelephone housing 29 has a display 31, user keys 32 and two  
5 coupling joints 33, where each coupling joint has a cylindrical aperture 34.

The top of the lid 30 has formed on it a boss 35. The boss 35 is sized to fit between the two coupling joints 33 of the main radiotelephone housing 29.

10 Each end of the boss has a recess 36 sized to house the cylindrical housing 2 of a hinge 27, 28. The inner surface of each recess 36 has two grooves 37 sized and positioned to engage with lugs 9 on the cylindrical housing 2. The lugs 9 and grooves 37 co-operate to prevent rotation of the cylindrical housing 2 in the boss recess 36.

15

Located in each coupling joint 33 is an actuation button 38. The actuation button 38 is a cylindrical element having a recess 39 on the end facing the lid boss 35 when the boss 35 is placed between the two coupling joints 33. The recess 39 is sized to allow the boss element 20 of the hinge 27, 28 to be  
20 pushed fit into the recess 39. Each actuation button 38 has two raised ridges 40 running axially along the outer cylindrical surface of the button 38. The raised ridges 40 have complementary grooves 41 on the inner surface of the coupling joints 33. The ridge 40 and grooves 41 co-operate to prevent rotation of the actuation button 38 in the coupling joint 33 while allowing axial  
25 movement of the actuation button 39.

When a hinge 27, 28 is mounted in the radiotelephone 26 the cylindrical housing 2 is located in the boss recess 36 with the hinge boss element 20 extending into the actuation button recess 39, thereby coupling the lid 30 to  
30 the main radiotelephone housing 29.

The hinge 27, 28 is arranged so that when the lid 30 is closed over the main radiotelephone housing 29 the lug 22 and groove 26 are aligned, with the compression bias of spring 25 causing the lug 22 and groove 26 to engage, thereby latching the lid 30 closed. When the actuation button 38 is moved axially towards the cylindrical housing 2 (i.e. the actuation button 38 is depressed) the lug 22 and groove 26 disengaged. When the actuation button 28 on both hinges 27, 28 are depressed together (i.e. the lug 22 and groove 26 are disengaged) hinges 27, 28 cause the radiotelephone lid 30 to rotate open. When the lid 30 is re-closed the lug 22 and groove 26 are re-aligned, thereby re-latching the lid 30 closed.

Each actuation button 38 extends slightly away from its respective coupling joint, as shown in figure 4, to allow a user to easily depress the actuation button 38 in towards the hinge 27, 28.

As each hinge 27, 28 faces away from each other, each hinge must rotate in an opposite direction to the other hinge. Therefore, the lug 22 and groove 26 for one hinge is aligned to provide a latched position in the opposite direction to the other hinge.

The skirt section 17 of the rotating member 3 limits the rotation of the lid 30 to  $160^\circ$ , as shown in figure 3. This allows optimum coupling between the radiotelephone 26 and a user's ear and mouth, however angles other than  $160^\circ$  can be used. However, the  $20^\circ$  rotational movement of the rotating member 3, as described above, allows the radiotelephone 26 to be forced flat without breaking the hinges 27, 28.

The present invention may include any novel feature or combination of features disclosed herein either explicitly or implicitly or any generalisation

thereof irrespective of whether or not it relates to the present claimed invention or mitigates any or all of the problems addressed. In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. For example,

5 the actuation button may form part of the hinge.

## CLAIMS

1. A hinge for rotating a first element of a radiotelephone between a first and second position, the hinge comprising a first part for mounting to the first element; a second part for mounting to a second element of the radiotelephone; and means for providing rotational movement between the first part and the second part in response to a longitudinal movement of the first part relative to the second part.
2. A hinge according to claim 1, wherein the first element is a radiotelephone lid.
3. A hinge according to claim 1 or 2, wherein the first part is an actuation button.
4. A hinge according to any preceding claims, wherein the means for providing rotational movement comprises a latch; and a spring arranged to extend the first part into the latch when a rotational bias is applied to the spring thereby defining a latched position which defines the first position of the first element.
5. A hinge according to any preceding claim, further comprising a stop for restricting rotation of the first part relative to the second part to define the second position of the first element.
6. A hinge according to claim 5, further comprising a rotating element to allow rotation of the first part relative to the second part beyond the position defined by the stop to allow the first element to be rotated past the second position.



7. A radiotelephone comprising a first element; a second element; and a hinge according to any proceeding claim.
8. A radiotelephone comprising a first element; a second element; and a first and second hinge, each hinge according to any of claims 1 to 6; wherein the first element of the radiotelephone is arranged to rotate in response to a longitudinal movement of the first part relative to the second part of both the first and second hinge..
9. A radiotelephone according to claim 7 or 8, wherein the hinge is, or hinges are, located towards the top of the second element as presented to a user during operation.
10. A hinge substantially as hereinbefore described with reference to the accompanying drawings, and/or as shown therein.
11. A radiotelephone substantially as hereinbefore described with reference to the accompanying drawings, and/or as shown therein.



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Application No: GB 9923942.8  
Claims searched: 1-11

Examiner: Barnaby Wright  
Date of search: 3 February 2000

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): E2F (FAA, FAE)

Int Cl (Ed.7): E05D 11/08, E05F 1/12, G06F 1/16, H04M 1/02

Other: Online: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X, Y	GB 2334068 A	NEC See whole document especially figs 1 & 2, and page 1, ln 17 to page 2, ln 9, and claim 1.	X: 1-5, 7 Y: 8, 9
X, Y	GB 2300880 A	MOTOROLA See especially figs 3 & 4, and page 10, ln 8 to page 11, ln 6.	X: 1-7 Y: 8, 9
X, Y	EP 0713313 A1	NEC See whole document especially figs 2-8.	X: 1-7 Y: 8, 9
X, Y	EP 0588210 A1	HITACHI See especially fig 5, and col 7, ln 34 to col 8, ln 24.	X: 1-5, 7 Y: 8, 9.
Y	US 5568358	NELSON	Y: 8, 9

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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